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New distributional records of Bumblebees (Hymenoptera: Apidae) from Bangus Valley in North Kashmir of Union territory of Jammu and Kashmir, India

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Abstract

During September-October 2020, survey was conducted to explore the new distributional records of bumblebees from different localities of Bangus valley in North Kashmir of Union territory of Jammu and Kashmir, India. It was found that seven species of bumblebees from genus *Bombus viz*., *B. albopleuralis* Friese, *B. asiaticus* Morawitz, *B. jacobsoni* Skorikov, *B. keriensis*- Morawitz, *B. rufofasciatus* Smith, *B. simillimus* Smith, and *B. tunicatus* Smith were recorded for the first time from Bangus valley in Kupwara district of North Kashmir. Among these seven bumblebee species, *B. keriensis* Morawitz, was found to be the most abundant species with respect to number of individuals in worker caste from Bangus valley. These species were collected in altitude of 2600-3000 m AMSL within the study area. The identified species of bumblebees include specimens of all castes *viz*., queens, workers and males. Host plants of each species of bumblebees were also recorded for the first time from the study area.

Keywords: Bangus Valley, Bumblebees, Distribution, Kashmir, New Record

Introduction

Bumblebees (Hymenoptera: Apidae) are highly scattered and most abundant visitors on flowers of high altitude habitats of northern hemisphere. The species of bumblebees are found all over Asia, Europe and North America. They are believed to be eusocial and are found foraging throughout in high land ecosystems and are greatly linked with diverse variety of wild and cultivated flowers (Saini *et al*., 2012). Unlike other types of bees, these insects are able to forage outside in cold and adverse environmental conditions and are considered as significant and competent pollinators (Abak *et al*., 2000; Semida & Elbanna, 2006). They are called excellent pollinators of Solanaceae such as tomatoes (*Solanum lycopersicum*- L.) due to their ability of buzz pollination (Van den Eijnde *et al*., 1991). In India, these bees are mostly limited to the high land ecosystems and different species of bees are confined to different elevations ranging from 1000 m to 5500 m AMSL (Saini *et al*., 2015). Due to their thermoregulatory abilities and heavy body pigmentation, bumblebees are most able to be active at very low ambient temperatures and are found abundant throughout the season (Corbet *et al*., 1993). In Europe, the distributional patterns of bumblebees have been linked with climatic factors (Pekkarinen *et al*., 1981). The high terrain of Kashmir Himalaya serves as a supportive ecosystem for bumblebees. There are 29 species of bumblebees recognized from Kashmir Himalaya and 53 species from Himalayas as a whole (Williams, 1991, 2004, 1998). The fieldwork in the Bangus valley was extremely difficult and challenging due to inaccessibility, also being very close to Line of Actual Control (LOC), between India and Pakistan. Thus the main aim of this study was to evaluate the distributional records of bumblebees (Hymenoptera: Apidae) from Bangus valley of North Kashmir of Union territory of Jammu and Kashmir, India.

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Material and Methods

Survey Area

The proposed study was conducted in September-October 2020 in three major habitats of Bangus valley in North Kashmir of Union territory of Jammu and Kashmir, India at altitude from 2600 to 3000 m AMSL, with geocoordinates N 34°22′46.6″, E 074°21′45.0″, N 34°22′09.9″, E 074°22′54.6″ and N 34°02′04.5″, E 074°21′42.9″ (Figures 1, 2 & 10). The Bangus valley is located about 115 kms from Srinagar, the summer capital of Union territory of Jammu and Kashmir. Its abundant green meadows and mountains are covered with variety of wild flowers including medicinal plants of the region. This gorgeous valley is divided into two regions *viz*., Big Bangus (Boud Bangus) and small Bangus (Lokut Bangus). GPS handsets (Garmin GPSMAP 64sc Site Survey) were used to record the coordinates of different habitats or their range within the study site.

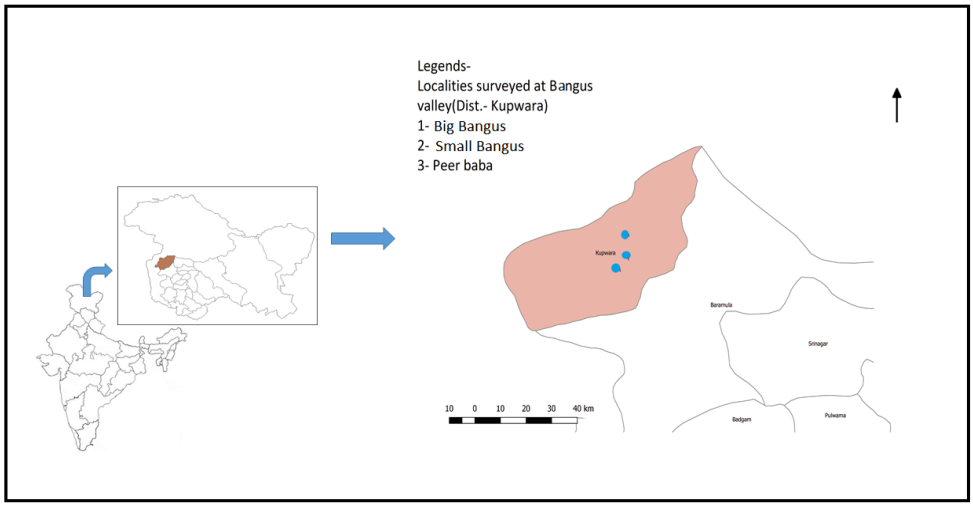

Figure 1. Map showing the study area for sampling of Bumblebee specimens from Bangus Valley in North Kashmir of Indian Himalayan Region.

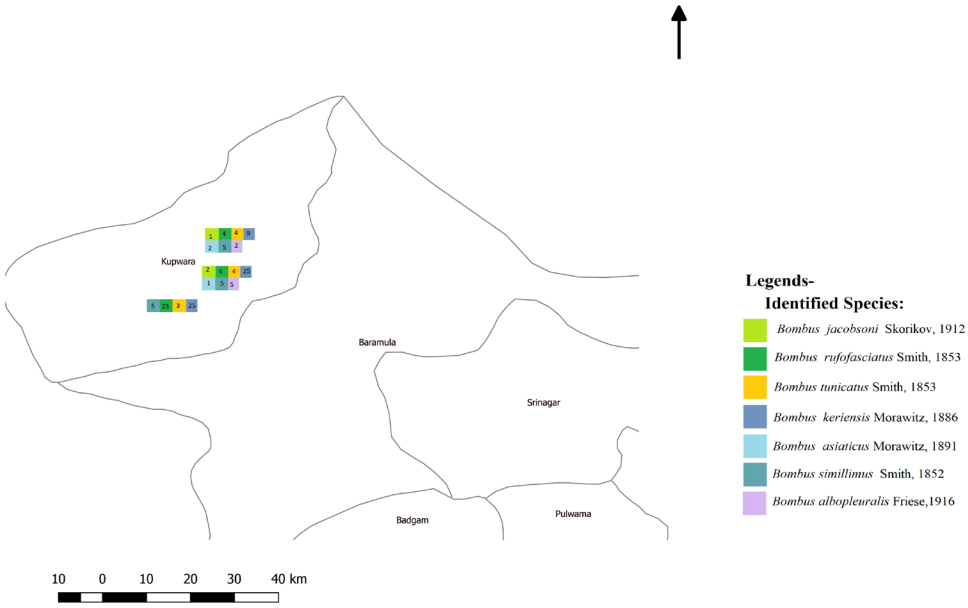

Figure 2. Species distribution of Bumblebees (Hymenoptera: Apidae) from Bangus valley, in North-Kashmir Himalaya of Indian Himalayan Region.

Sample Collection

The bumblebees sampling was made by sweeping hand net and later killed using killing bottle containing ethyl acetate. In addition, some bees were collected into the small plastic water bottles. Once empty and dried, they can have ventilation holes added all over with forceps. Then absorbent papers were put inside to keep the bees dry and give them a substrate to hold on to. The bees were killed by placing the bottle in a fridge freezer at night. The bees were removed, pinned and dried quickly the next day, usually in a cardboard box, kept open as much as possible, so that water vapour can escape. This may help with successful DNA sequencing by reducing degradation of the DNA. All the collected specimens were pinned in the Entomological cardboard boxes in the field during the survey period and later on, the collected material has been transferred and deposited in the National Zoological Collection at Zoological Survey of India, Desert Regional Centre, Jodhpur, Rajasthan, India. Photographs of the species, landscapes, habitats and host plants of these bees were taken simultaneously on digital format. The specimens were later identified with the help of available literature (Williams, 1991; Saini *et al*., 2015).

Results

The systematic account for the identified and newly distributed species of bumblebees (Hymenoptera: Apidae) of Bangus valley are presented below:

Systematic Account
Order HYMENOPTERA
Super family APOIDEA
Family APIDAE
Sub family APINAE
Tribe **Bombini**
Genus ***Bombus*** Latreille, 1802

1. *Bombus* (*Megabombus*) *albopleuralis* Friese, 1916 (Figure 3)

B. trifasciatus Smith, **1852**: 45.

B. montivagus Smith, **1878**: 168.

B. secundus Dalla Torre, **1890**: 168.

B. wilemani Cockerell, **1911**: 100.

Material examined: INDIA: Boud Bangus (Big Bangus valley), 2 ♂♂, 4 ♀♀, 24.ix.2020, N 34°22′46.6″, E 074°21′45.0″, Alt. 3000 m- Coll. Parrey & Imran, NZC Regd. No.10644/A; Lokut Bangus (Small Bangus valley), 1 ♂, 2 ♀♀, 25.ix.2020, N 34°22′09.9″, E 074°22′54.6″, Alt. 2872 m respectively- Coll. Parrey & Imran, NZC Regd. No.10647/A.

Distribution within India: Himachal Pradesh, Uttarakhand, Kashmir, West Bengal, Sikkim, Meghalaya, Arunachal Pradesh and Manipur- (Williams 1991, 2004; Saini *et al*., 2015).

Distribution worldwide: India, Afghanistan, Pakistan, Bhutan, Nepal, Myanmar, Thailand, Malaysia, Laos, Vietnam, China (including Tibet), Taiwan- (Williams, 2004; Williams *et al.*, 2010).

New Distribution: First time recorded from Bangus valley (Kupwara).

Host plants: Trifolium repens L., T. pretense L., Cicerbita alpine L.

Figure 3. *Bombus albopleuralis* (Friese, 1916) ♂.

2. *Bombus* (*Sibricobombus*) *asiaticus* Morawitz, 1875 (Figure 4)

B. hortorum var. *asiatica* Morawitz in Fedtschenko, **1875**: 4.

B. longiceps Smith, **1878**: 168.

B. regeli Morawitz, **1880**: 337.

Material examined: INDIA: Boud Bangus (Big Bangus valley), 1 ♂, 2 ♀♀, 24.ix.2020, N 34°22′46.6″, E 074°21′45.0″, Alt. 3000 m- Coll. Parrey & Imran, NZC Regd. No.10653/A; Lokut Bangus (Small Bangus valley), 2 ♂♂, 2 ♀♀, 24.ix.2020, N 34°22′09.9″, E 074°22′54.6″, Alt. 2872 m respectively- Coll. Parrey & Imran, NZC Regd. No.10638/A.

Distribution within India: Himachal Pradesh, Uttarakhand, Sikkim, Kashmir and Ladakh- (Williams 1991, 2004; Saini *et al*., 2015).

Figure 4. *Bombus asiaticus* (Morawitz, 1875) ♀.

Figure 5. *Bombus jacobsoni* (Skorikov, 1912) ♀.

Distribution worldwide: India, Nepal, Pakistan, Afghanistan, China (including Tibet), Kazakhstan, Tajikistan and Mongolia- (Williams *et al*., 2010).

New Distribution: First time recorded from Bangus valley (Kupwara).

Host plants: Trifolium pretense L., *Cicerbita alpine* L.

3. *Bombus* (*Bombus*) *jacobsoni* Skorikov, 1912 (Figure 5)

Apis cryptarum Fabricius, **1775**: 379.

B. modestus Cresson, **1863**: 99.

B. modratus Cresson, **1863**: 109.

Material examined: INDIA: Boud Bangus (Big Bangus valley), 1 ♂, 2 ♀♀, 22.ix.2020, N 34°22′45.3″, E 074°21′43.0″, Alt. 2944 m- Coll. Parrey & Imran, NZC Regd. No. 10646/A; Lokut Bangus (Small Bangus valley), 1 ♂, 6 ♀♀, 25.ix.2020, N 34°22′09.9″, E 074°22′54.6″, Alt. 2872 m respectively- Coll. Parrey & Imran, NZC Regd. No. 10655/A.

Distribution within India: Himachal Pradesh, Uttarakhand, Kashmir, Ladakh, Sikkim, and Arunachal Pradesh- (Williams, 1991, 2004; Saini *et al.,* 2015).

Distribution worldwide: India, Pakistan, Afghanistan, Nepal, Bhutan, Myanmar, Europe, Canada, Japan, North Korea, China (including Tibet), Japan, Iran, Kamchatka, Kazakhstan, Korea, Kyrgyzstan, Tajikistan, Turkey, and Russia- (Williams, 2004; Williams *et al*., 2010).

New Distribution: First time recorded from Bangus valley (Kupwara).

Host plants: *Artemisia absinthium* L

4. *Bombus* (*Melanobombus*) *keriensis* Morawitz, 1886 (Figure 6)

B. separandus Vogt, **1909**: 58.

B. kohli Vogt, **1909**: 41.

B. kohli var. postzonatus Vogt, **1909**: 61.

B. kazlovi Skorikov, **1910**: 413.

B. lapidaries var. tenellus Friese, **1913**: 86.

Material examined: INDIA: Lokut Bangus (Small Bangus valley), 9 ♂♂, 16 ♀♀, 24.ix.2020, N 34°22′48.6″, E 074°21′44.3″, Alt. 2700 m- Coll. Parrey & Imran, NZC Regd. No.10651/A; Peer Baba 3 ♂, 13 ♀♀, 23.ix,2020, N 34°22′48.5″, E 074°21′43.9″, Alt. 2683 m respectively- Coll. Parrey & Imran, NZC Regd. No.10652/A.

Distribution within India: Himachal Pradesh, Uttarakhand, Sikkim, Kashmir and Ladakh (Kargil). Arunachal Pradesh- (Williams 1991, 2004; Saini *et al*., 2015).

Distribution worldwide: Oriental region, Palaearctic region, India, Nepal, Pakistan, China (including Tibet), Afghanistan, Bhutan, Mongolia, Kyrgyzstan, Kazakhstan, Tajikistan, Turkey, Iran- (Williams, 1991, 2004).

New Distribution: First time recorded from Bangus valley (Kupwara).

Host plants: *Cicerbita alpine L., Taraxacum officinale* Weber, *Trifolium repens* L., *Carduus* sp., *Pedicularis pectinata* Wall, P.

Figure 6. *Bombus keriensis* (Morawitz, 1886) ♀.

Figure 7. *Bombus rufofasciatus* (Smith, 1852) ♀.

5. *Bombus* (*Melanobombus*) *rufofasciatus* Smith, 1852 (Figure 7)

B. prshewalskyi Morawitz, **1880**: 342.

B. rufocinctus Morawitz, **1880**: 343.

B. chinensis Dalla Torre, **1890**: 139.

Material examined: INDIA: Boud Bangus (Big Bangus valley), 3 ♂♂, 4 ♀♀, 23.ix.2020, N 34°22′46.4″, E 074°21′45.8″, Alt. 2900 m- coll. Parrey & Imran, NZC Regd. No.10650/A; Peer Baba, 4 ♂♂, 23 ♀♀, 26.ix.2020, N 34°22′44.3″, E 074°21′42.9″, Alt. 2683 m respectively- Coll. Parrey & Imran, NZC Regd. No.10643/A.

Distribution within India: Himachal Pradesh, Uttarakhand, Sikkim, Kashmir, Ladakh (Kargil), and Arunachal Pradesh- (Williams, 1991, 2004; Saini *et al*., 2015).

Distribution worldwide: India, Nepal, Pakistan, Bhutan, China (including Tibet), Myanmar- (Williams, 2004; Williams *et al*., 2010).

New Distribution: First time recorded from Bangus valley (Kupwara).

Host plants: *Trifolium repens* L., *Myosotis arvensis* L., *Hyoscyamus niger* L., *Carduus edelbergii* Rech. f.

6. *Bombus* (*Melanobombus*) *simillimus* Smith, 1852 (Figure 8)

B. similis Smith, **1854**: 3.

B. tonsus Skorikov, **1922**: 160.

B. terrestris var. grossiventris Friese, **1931**: 303.

Material examined: INDIA: Boud Bangus (Big Bangus valley), 9 ♂♂, 23.ix.2020, N 34°22′46.6″, E 074°21′45.0″, Alt. 3000 m- Coll. Parrey & Imran, NZC Regd. No.10648/A; Peer Baba, 5 ♀♀, 26.ix.2020, N 34°02′04.5″, E 074°21′42.9″, Alt. 2683 m- Coll. Parrey & Imran, NZC Regd. No.10639/A.

Distribution within India: Himachal Pradesh, Kashmir and Uttarakhand- (Williams, 1991; Saini *et al*., 2015)

*Distribution worldwide***:** India and Pakistan - (Williams, 1991, 2004).

New Distribution: First time recorded from Bangus valley (Kupwara).

Host plants: Trifolium pretense L., *Carduus edelbergii* Rech.f, *Taraxacum officinale* Weber, *Cicerbita alpine* L.

Figure 8. *Bombus simillimus* (Smith, 1852) ♀.

7. *Bombus* (*Bombus*) *tunicatus* Smith, 1852 (Figure 9)

B. vallestris Smith, **1878**: 168.

B. gilgitensis Cockerell, **1905**: 223.

B. terrestris var. simlaensis Friese, **1909**: 674.

B. terrestris var. fulvocinctus Friese, **1909**: 674.

Material examined: INDIA: Boud Bangus (Big Bangus valley), 3 ♂♂, 2 ♀♀, 24.ix.2020, N 34°22′46.6″, E 074°21′45.0″, Alt. 3000 m- Coll. Parrey & Imran, NZC Regd. No.10640/A; Peer Baba 7 ♂, 6 ♀♀, 23.ix,2020, N 34°22′48.5″, E 074°21′43.9″, Alt. 2683 m respectively- Coll. Parrey & Imran, NZC Regd. No.10637/A.

Distribution within India: Himachal Pradesh, Sikkim, West Bengal, Uttarakhand, Kashmir and Ladakh- (Williams, 1991; Saini *et al.*, 2015)

Figure 9. *Bombus tunicatus* (Smith, 1852) ♀.

Figure 10. Bangus valley.

Distribution worldwide: India, Nepal, Afghanistan and Pakistan- (Williams, 2004; Williams *et al.,* 2010).

New Distribution: First time recorded from Bangus valley (Kupwara).

Host plants: Trifolium pretense L., *Carduus edelbergii* Rech.f.

Discussion

The present study was carried out in green meadows and slopes of Bangus valley in North Kashmir for the first time during September to October 2020. A total of 129 bumblebees were collected from the study area. All the specimens were examined and identified up to species level and it was revealed the occurrence of seven species of bumblebees belonging to four sub-genera *viz*., *Bombus, Megabombus, Melanobombus* and *Sibricobombus* and are new records to the Bangus valley in North Kashmir of Union Territory of Jammu and Kashmir. The open sunny meadows are most favoured by these species in comparison to the closed deep and thick forests. During the current study the bumblebee species were found foraging heavily in the noon time with limited activity in the early morning and late afternoon. The present study was first of its kind in the area. The area needs extensive survey as it was predicted that many more species of bumblebees may be recorded, so that the people from this area may take full advantage from these indigenous mountain pollinators of the Indian Himalayan Region.

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